

PhyzJob: Conservation of Momentum with Numbers (1-D)



INSTRUCTIONS: In each of the scenarios below, some information regarding the system (or elements within the system) is given. Provide the missing information based on what you know about conservation of momentum. The pictures (and other helpful equations and ideas) are on the PhyzJob: Conservation of Momentum Basics. Please have it handy while you work through this sheet. All cases below are in one dimension.

1. The Stationary Bomb Explodes. The 10kg bomb is initially at rest. It explodes into two pieces that move in opposite directions. The 7.0kg piece moves to the left at 1.43m/s. How fast does the 3.0kg piece move?

$$m_1 + m_2 = 10\text{kg}$$

$$m_1 = 7.0\text{kg}$$

$$m_2 = 3.0\text{kg}$$

$$v_1 = v_2 = 0$$

$$v_1' = -1.43\text{m/s}$$

$$v_2' = ?$$

$$p = p'$$

$$p = 0$$

$$p' = p_1' + p_2'$$

$$0 = p_1' + p_2'$$

$$0 = m_1v_1' + m_2v_2'$$

$$m_2v_2' = -m_1v_1'$$

$$v_2' = -m_1v_1' / m_2$$

$$v_2' = (-7.0\text{kg} \cdot -1.43\text{m/s}) / 3.0\text{kg}$$

$$\underline{v_2' = +3.3\text{m/s}}$$

2. A Blob of Clay Collides with a Stationary Blob of Clay. A 5kg blob moving at 2m/s to the right collides inelastically with a 2kg piece at rest. What is the speed of the conjoined blob?

3. A Metal Ball Collides With a Stationary Metal Ball. A 2kg ball moving at 5m/s to the right collides elastically with a 2kg ball at rest. Afterward, the first ball is at rest. What is the final speed of the second ball?

4. A Moving Bomb Explodes. A 3kg bomb is initially moving to the right at 3.33m/s. After it explodes, a 2kg piece moves to the left at 5m/s. What is the final speed of the 1kg piece?

5. Moving Blobs of Clay Collide. A 5kg blob of clay moving at 2m/s to the right collides inelastically with a blob of clay moving to the left at 2m/s. Afterward, the conjoined blob is moving at 0.5m/s to the right. What was the mass of the blob that was originally moving to the left?

6. Moving Metal Balls Collide. *Use the HOPE equation for this one.* A 2.5kg ball moving at 4m/s to the right collides elastically with a 1.86kg ball at rest. What is the final speed of each?

5. 1.43m/s 3.2m/s 4.50m/s 2.3kg 0.1:0.2m/s 5:4.2m/s